

DRY COOLING: A HOT SOLUTION FOR POWER PLANTS

Power plants are big users of energy. It takes huge amounts of water, for example, to drive traditional power plants. Now technology is available to significantly reduce water usage — dry cooling spray enhancement.

It all starts with dry cooling. When dry cooling is used, there is no steam released: water is cooled and condensed, then reused, saving a tremendous amount of water energy. In fact, a 500-MW combined-cycle power plant using wet cooling technology requires, on average, 3 million gallons of water per day for cooling. The same power plant using dry cooling technology will require only about 5 percent – or 0.15 million gallons per day – of this total. The water savings, approximately 2.85 million gallons per day, could satisfy the water demands of more than 12,000



Spray Enhancement at Crockett cogeneration plant provides a 7-12 megawatt increase in production on hot days.

people annually – nearly enough to supply the annual needs of Auburn, California.

Despite this enormous water savings, most power plants still use wet cooling. One reason for this is that technical problems with dry cooling systems have traditionally prevented facilities from maintaining normal electricity output during the hottest periods of the year, cutting into electricity production as a result of increased turbine back pressure. In

California, this occurs at the same time that the state's electricity demand is the highest, which can affect electrical system reliability.

That's where spray enhancement comes in.

How It Works

Introducing a small amount of water spray into the inlet air stream to the cooling tower, cools the air when it evaporates. Reducing inlet air temperature even by a

few degrees can help maintain much of the plant output during hot hours. This spray enhancement technique uses a modest supply of water, has a low initial cost, and can be used to retrofit existing units.

Spray systems have been used successfully in applications such as process coolers or gas turbine inlet air-cooling. But to evaluate the reliability and cost-effectiveness of this technique in larger applications, it is necessary to demonstrate it on units with the capacity necessary to handle the large airflows in air-cooled condensers for power plants.

(Cont.)



“Dry cooling spray enhancement will be a valuable energy resource that’s designed to meet California’s need for electricity while protecting the environment and conserving precious water supplies,” said Energy Commissioner, Arthur Rosenfeld. “We’re keeping our commitment to ratepayers to find power solutions that make a positive contribution to the economy and quality of life.”

Dry cooling systems offer a reliable power supply, environmentally sound electricity, and safe electricity.

Evolving Tomorrow’s Energy

The State of California and energy researchers are studying spray enhancement and the dry cooling technique in a pilot project at the Crockett Cogeneration Facility in Crockett, California. There it is expected that the spray enhancement may help the 240-megawatt facility generate an additional 7 to 12 megawatts of electricity during summer days. Researchers will use information gathered from this project to develop other promising uses of the technology.

What does this mean for California? Clean, reliable energy — and more of it. If more dry cooling spray enhancement is used throughout the power industry, then the extra electricity can be used to prevent rolling blackouts during peak demand hours. Millions of gallons of water can be conserved each day. And, the demonstrated performance and economic success of spray enhancement as a technique for reducing efficiency losses during hot weather may foster power producers’ acceptance of dry cooling technology. By replacing the use of wet cooling systems on existing and future generating facilities, these systems could provide long-term water conservation benefits.

The spray enhancement and dry cooling technology project is just one of the energy research projects supported by the California Energy Commission’s Public Interest Energy Research Program (PIER). Established in 1998, the PIER program conducts energy research and develops environmentally sound, safe, and affordable products and technologies for California. PIER, part of the California Energy Commission, is dedicated to strengthening California’s economy by delivering energy efficient solutions to the marketplace.

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